

## Dynamic Compression Plate (DCP) and Limited Contact Dynamic Compression Plate (LC-DCP) Application for Management of Large Bone Fractures

S. Ayyappan<sup>1</sup>

Professor

Department of Veterinary Surgery and Radiology

Madras Veterinary College

Tamilnadu Veterinary and Animal Sciences University

Chennai - 600007 (Tamil Nadu)

### Abstract

The application of 'absolutely' stable compression osteosynthesis is the basis for successful fracture treatment in small animals and was realized through generation of a multitude of stabilization techniques for the different fracture types in various anatomical areas and for special orthopaedic interventions. This was achieved through a specifically developed implant- instrument system and corresponding surgical methods. These techniques revolutionized fracture fixation in small animals. The dynamic compression plate which was a special implant developed by the AO/ASIF group and a second generation plating system called limited contact dynamic compression plate provided axial compression suitable to manage 'two piece fractures' and 'segmental' fractures respectively.

**Keywords:** AO/ASIF, axial compression, DCP; LC-DCP, stress

### Introduction

The primary objective of fracture management is to restore the anatomical shape of the fractured bone and return the injured limb to early and full function. The development of Association for Osteosynthesis/Association for the Study of Internal Fixation (AO/ASIF) principles of fracture management revolutionized the treatment of fractures in humans and subsequently these techniques were adopted successfully in Veterinary practice.

The dynamic compression plate is a special implant developed by the AO/ASIF group for axial compression and stabilization of transverse fractures. Axial compression provided stable fixation by counteracting disruptive forces and promoting early union resulting in an excellent functional outcome. Compression has no osteogenic properties. It increases fracture stability through frictional impact loading and narrowing the gap between fragments providing an optimum condition for direct bone union. Healing takes place by primary union without the formation of a callus.

### Principle of Dynamic Compression Plate (DCP)

Long bones are subjected to eccentric loading-one side under tension and other side under

compression (Humerus-cranio-lateral, Femur-lateral and Tibia-Medial). Application of a plate to the tension surface of bone will allow the tension band effect to apply and will result in axial compression of bone under the plate. This is called dynamic compression and is most applicable for repairing simple transverse fractures.

The oval shape of dynamic compression plate hole is designed to generate compression at the fracture site. Each screw hole has a 'ramp' sloping towards the centre of plate and is referred to as the eccentric hole. When a fully threaded cortical screw is inserted eccentrically in the 'ramp' and completely tightened, the screw produces 1mm of axial compression. The bone fragment will be pushed 1mm towards the opposite bone fragment bringing about axial compression.

### Technique of Application

- Follow strict asepsis and sterile procedures as infection around implants can lead to non union, delayed union and osteomyelitis.
- Plate application requires wider bone exposure. Ensure minimal disruption to soft tissue and vascular structures. Achieve anatomic reduction by toggling /traction and maintain reduction using appropriate instrumentation.
- Pre-stress the plate at level of fracture gap

1. Corresponding Author  
E-mail : jujups61@hotmail.com

- Select appropriate size plate. Longer plate should be used wherever possible as they distribute stresses more evenly on the loaded bone.
- A standard guide chart for selection of plates with respect to bone and animal body weight is available. Appropriate drill bits, load and neutral drill guides, drill and tap sleeve, depth gauge, cortical taps and screw drivers are used (2mm, 2.7mm, 3.5mm and 4.5mm systems are available). Plate sizes available are 2mm, 2.7mm, 3.5mm (broad and narrow) and 4.5mm (broad and narrow). 2mm, 2.7mm, 3.5mm and 4.5mm fully threaded cortical screws are used for the corresponding plates when dealing with shaft fractures.
- Using the 'load' drill guide (Yellow drill guide-arrow towards fracture), one screw each is inserted close to fracture at both ends of the plate to facilitate compression of fracture ends. Prior to tightening the second compression screw, the first compression screw is loosened and subsequently tightened. The remaining screws are inserted in a neutral position (Green drill guide) moving away from the centre to the end of the plate on alternate sides of the fracture until all holes are filled and fully tightened. Place a minimum of three screws through the plate on each side of the fracture line. Avoid placing screws on the plate over the fracture line.
- Plates are removed following accomplishment of fracture healing. Information regarding suggested time for removal of plates is well documented in literature.



Fig.1 : Dynamic compression plate

- DCP as a compression plate can be used only in transverse fractures and cannot be applied for comminuted or fractures with a butterfly segment (Fig. 1).

#### Principle and Application of Limited Contact-Dynamic Compression Plate (LC-DCP)

The AO/ASIF group developed a second generation plating system called the limited contact dynamic compression plate (LC-DCP) to overcome the shortcomings of a DCP such as a flat undersurface, uneven plate hole distribution (extended middle segment) and a lesser angle of screw insertion of 25°. The LC-DCP has many improvements over the standard DCP. It is slightly thinner and has scalloped edges between the screw holes on the contact side of the plate. The scalloped contact surface is intended to reduce bone plate contact without reducing the friction between implant, improve cortical vascularity and decrease osteoporosis. The geometry of the plate allows even distribution of stiffness and preempts 'stress protection' (Fig. 2).

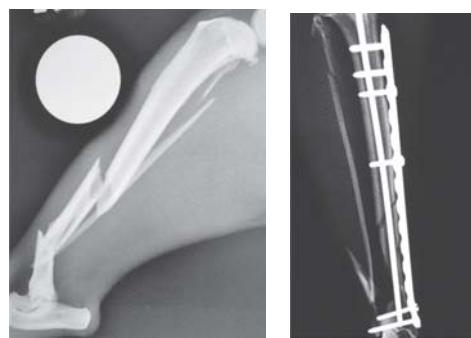


Fig. 2 : Limited contact Dynamic compression plate

The screw holes are positioned at equal distances from the plate thus preventing screw holes from acting as stress risers. The screw holes have two similar 'ramps' inclined at both ends permitting compression in either direction and is particularly suitable in treating segmental fracture. The underside of the screw hole is larger permitting a 40° angle for insertion of the screw in each direction along the long axis of the bone. The technique of compression is similar to a DCP application. Two LC-DCP drill guides are used for 3.5mm and 4.5mm plates. A neutral (green) guide is used to center the drill in the plate hole and an eccentric (yellow) or load guide is used to drive an eccentric hole in the plate hole. A specially devised universal spring loaded drill guide (with an inner and an outer sleeve) which permits placement of the drill bit in a neutral or eccentric position relative to the plate hole can also be used.